



ANNUAL REPORT 1964

BURLINGTON

Skyway

**water pollution
control plant**

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ONTARIO WATER
RESOURCES COMMISSION

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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Burlington Skyway : water
pollution control plant.

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

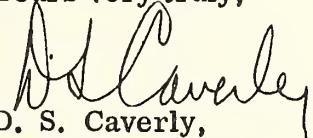
Members of the Burlington Skyway Local Advisory Committee,
Town of Burlington.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for
the Burlington Skyway Water Pollution Control Plant, OWRC Project
No. 62-S-105.

By continuing the mutual cooperation which has existed in the past,
we can look forward to greater progress in the field of water
pollution control.

Yours very truly,


D. S. Caverly,
General Manager



Environment Canada
Water Quality Bureau
Burlington, Ontario N1R 2J5
Canada

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General Manager,
Ontario Water Resources Commission.

Dear Sir:

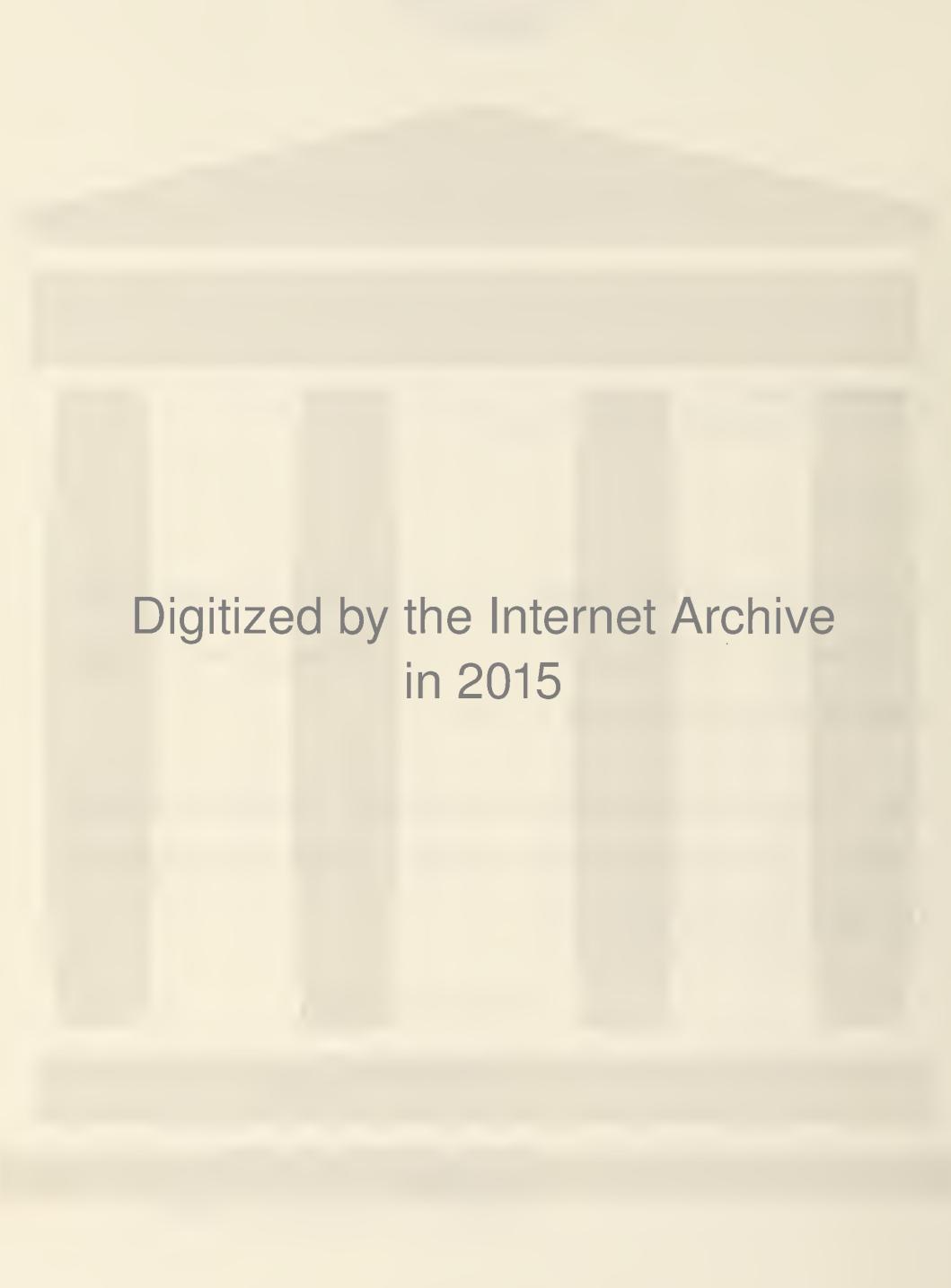
It is with pleasure that I present to you the Annual Report of the operation of the Burlington Skyway Water Pollution Control Plant, OWRC Project No. 62-S-105 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B.C. Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.



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FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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BURLINGTON
Skyway
operated for
THE TOWN OF BURLINGTON
by the
ONTARIO WATER RESOURCES COMMISSION

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: B. G. Porter

801 Bay Street Toronto 5

'64 REVIEW

The report gives in detail significant data on the operation of various treatments at the Burlington Skyway Water Pollution Control Plant during 1964.

Until the east end trunk sanitary sewer Phase II was completed and placed in operation on September 2, 1964, the flow to the plant was not large enough to measure with the equipment installed at the plant. The average daily flow was estimated to be in the order of 100,000 gallons. During this period, two aeration tanks were in service and one air blower was operated one hour per day.

With the completion of the east end trunk sanitary sewer, the daily flow increased sharply to an average of 2.24 million gallons. All aeration tanks were placed in service and air was added continually.

The total 1964 operating cost was \$43,403. The cost per million gallons treated was higher than normal. However, this was expected because of the very low flows treated until the east end, trunk sewer, phase II was placed in operation.

Final effluent was chlorinated for disinfection purposes until October 15. In the future final effluent will be chlorinated between May 15 and October 15.

The maintenance period expired on July 19, 1964.

A new one-half ton truck was purchased at the beginning of the year. Although the truck was stationed at the Skyway Water Pollution Control Plant it was also used at the Drury Lane and Elizabeth Gardens plants.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
communition	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY

1960 - 1964

INCEPTION

In August 1960, the Town of Burlington and the Ontario Water Resources Commission initiated plans for the construction of the Skyway Water Pollution Control Plant.

The firm of James F. McLaren Associates, Consulting Engineers was engaged to prepare plans and specifications for the project.

APPROVAL

On May, 1962, the Town executed an agreement with the Ontario Water Resources Commission to finance, construct, and operate the plant.

CONSTRUCTION

Bedford Construction Company Limited began construction in May 1962 and the Division of Plant Operations took over operation in December 1963.

TOTAL COST

The total cost of the project was \$1,797,344.53.



C. FIDDY
SUPERINTENDENT

Project Staff

Maintenance Technician - W. Cunningham

Operators

K. Baird T. Doyle
J. Evans

COMMENTS

At the beginning of the year there were two operators at the plant in addition to the maintenance technician and the Superintendent. These operators were Messrs. J. Stinson and J. Evans. The number of operators was increased to three on March 2, when Mr. L. Newton was hired. Mr. Newton resigned on May 29.

On June 18, a personnel transfer occurred between the Drury Lane plant and the Skyway plant. Mr. J. Stinson was transferred to the Drury Lane plant and Messrs. K. Baird and T. Doyle were transferred to the Skyway plant. Whenever extra operators were required at either the Drury Lane or the Elizabeth Gardens plants, they were obtained from the Skyway plant when available. This arrangement proved to be successful.

The plant was normally supervised eight hours per day during the week and four hours per day during the weekend.



ONE OF FINAL CLARIFIERS

Description of Project

PRIMARY TREATMENT

Raw sewage enters the plant pumping station through a 48 inch diameter influent sewer. It then passes through a coarse mechanical, back-cleaned bar screen with 2.5 inch clear openings before reaching the pumping station wet well. From the wet well, the sewage is pumped to a distribution chamber in the grit building.

From the distribution chamber, sewage flows either through a fine mechanical, back-cleaned bar screen with 1.0 inch clear openings or a bypass around the

bar screen to the grit removal tanks. The flow velocity through the grit removal tank is controlled with the use of air diffusers. The grit is removed from the tank by a power hoist and "clam shell". Both the grit and screenings are then trucked away.

SECONDARY TREATMENT

Effluent from the grit removal tank then flows by gravity to six single pass aeration tanks where it is mixed with activated sludge. The volume of each tank is 688,000 gallons. With a design flow of 3.125 mgd the detention time in the

aeration section is 31.7 hours and 21.1 hours with a raw sewage flow of 3.125 mgd and 50 percent return sludge.

Air is supplied by ceramic diffusers, 250 per tank. There are three multi-stage centrifugal blowers, each with a maximum capacity of 4000 cfm.

FINAL SEDIMENTATION

Activated sludge from the aeration section flows by gravity to two final clarifiers. Each clarifier has a volume of 269,000 gallons. With a raw sewage flow of 3.125 mgd a detention period of 4.1 hours is provided with both clarifiers in operation. The clarifier mechanism is of the pier supported plough type supplied by Babcock-Wilcox and Goldie McCulloch Limited.

Activated sludge from the final settling tanks is returned to the raw sewage pumping station wet well through a gravity 18 inch diameter return sludge pipe and a 16 inch diameter process drain pipe.

SLUDGE DISPOSAL

Waste activated sludge is pumped into the sludge thickening tank which has a volume of 17,700 gallons. From the sludge thickening tank the waste sludge can be pumped to a tank truck. Waste sludge can also be pumped directly from the clarifiers to a tank truck. Supernatant from the sludge thickening tank is returned to the raw sewage pumping station wet well.

CHLORINATION

There are two Fischer and Porter Model 70C3400 chlorinators installed in the blower building. The chlorinators have a maximum capacity of 2000 pounds chlorine per 24 hours. Chlorine can be applied to the final effluent channel upstream of the Parshall flume (post chlorination) or if necessary to the wet well of the raw sewage pumping station.

MR. FIDDY INSPECTS
ONE OF PROJECT'S
SIX AERATION TANKS



PROJECT COSTS

LONG TERM DEBT TO OWRC: \$557,285.00

The total cost to the municipality during 1964 was as follows:

Net Operating	\$ 43,402.99
Debt Retirement	20,204.00
Reserve	13,125.00
Interest Charged	31,225.29
 TOTAL	 \$107,987.28

RESERVE ACCOUNT

Balance at January 1, 1964	\$ 5,468.00
Deposited by municipality	13,125.00
Interest Earned	574.47
 \$ 19,167.47	

<u>Less</u> Expenditures	-
 Balance at December 1, 1964	 \$ 19,167.47

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDAY	WATER
JAN	2418.65	696.23			1544.00			99.20		79.22	
FEB	5971.86	1125.94			1730.13	1998.90	391.81	582.61		82.18	60.29
MARCH	3216.47	1777.59			1239.37		10.92		94.14	94.45	
APRIL	3118.43	1810.32			1148.94		14.93			83.95	60.29
MAY	5920.61	2747.50			1177.88		246.73	1544.82	141.13	62.55	
JUNE	2057.59	1602.52			209.79		114.09	70.90			60.29
JULY	2976.40	1506.52			604.33	42.40	87.81	648.00	25.14	62.20	
AUG	2423.66	1530.52			626.26		104.79	60.80		41.00	60.29
SEPT	4313.82	1544.89			806.03		86.46			1876.44	
OCT	7631.12	1535.82			1604.50	1998.90	147.48		441.61	1842.52	60.29
NOV	3715.86	1535.82			1998.48		83.58			97.98	
DEC	(361.48)	(3095.65)			4702.05	(2700.00)	301.10	64.14	159.41	147.18	60.29
TOTAL	43402.99	14318.02			17391.76	1340.20	1589.70	3070.47	861.43	4469.67	361.74

* SUNDAY INCLUDES SLUDGE HAULING COSTS WHICH WERE
BRACKETS INDICATE CREDIT

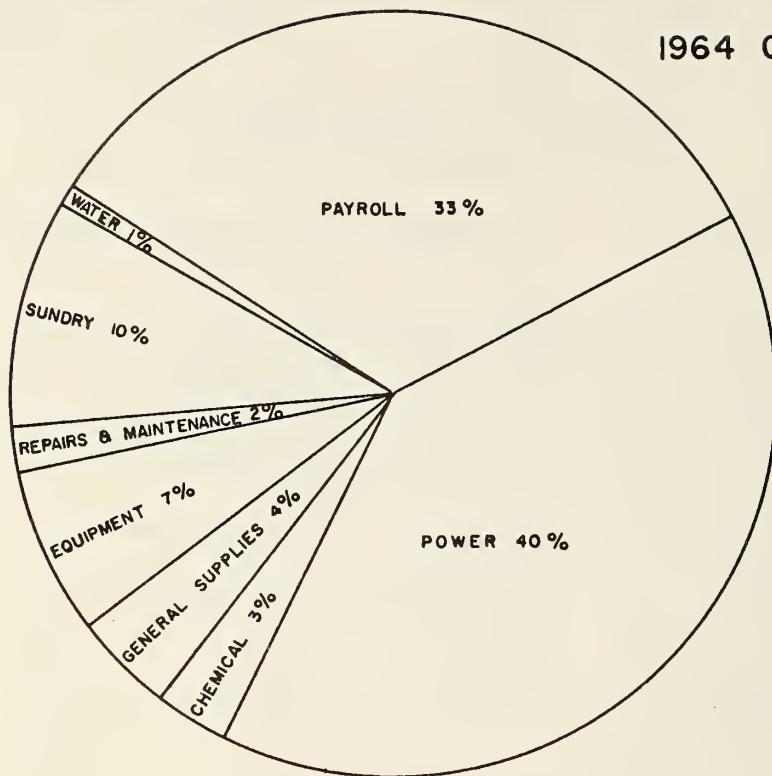
YEARLY COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1964	271,006 +	43402.99	7.78 **	160.15	8 CENTS

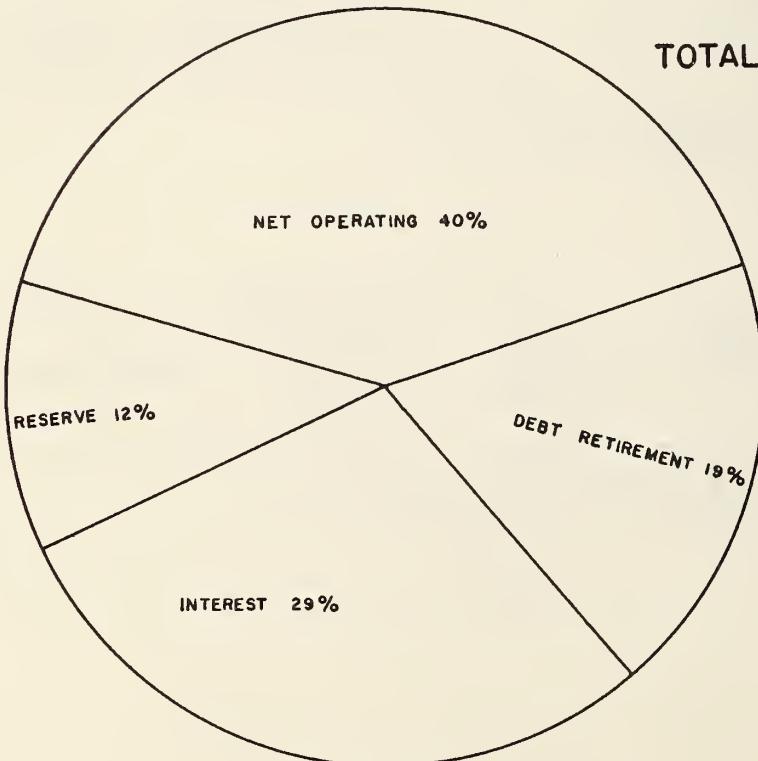
+ OPERATION FROM SEPTEMBER TO DECEMBER 1964

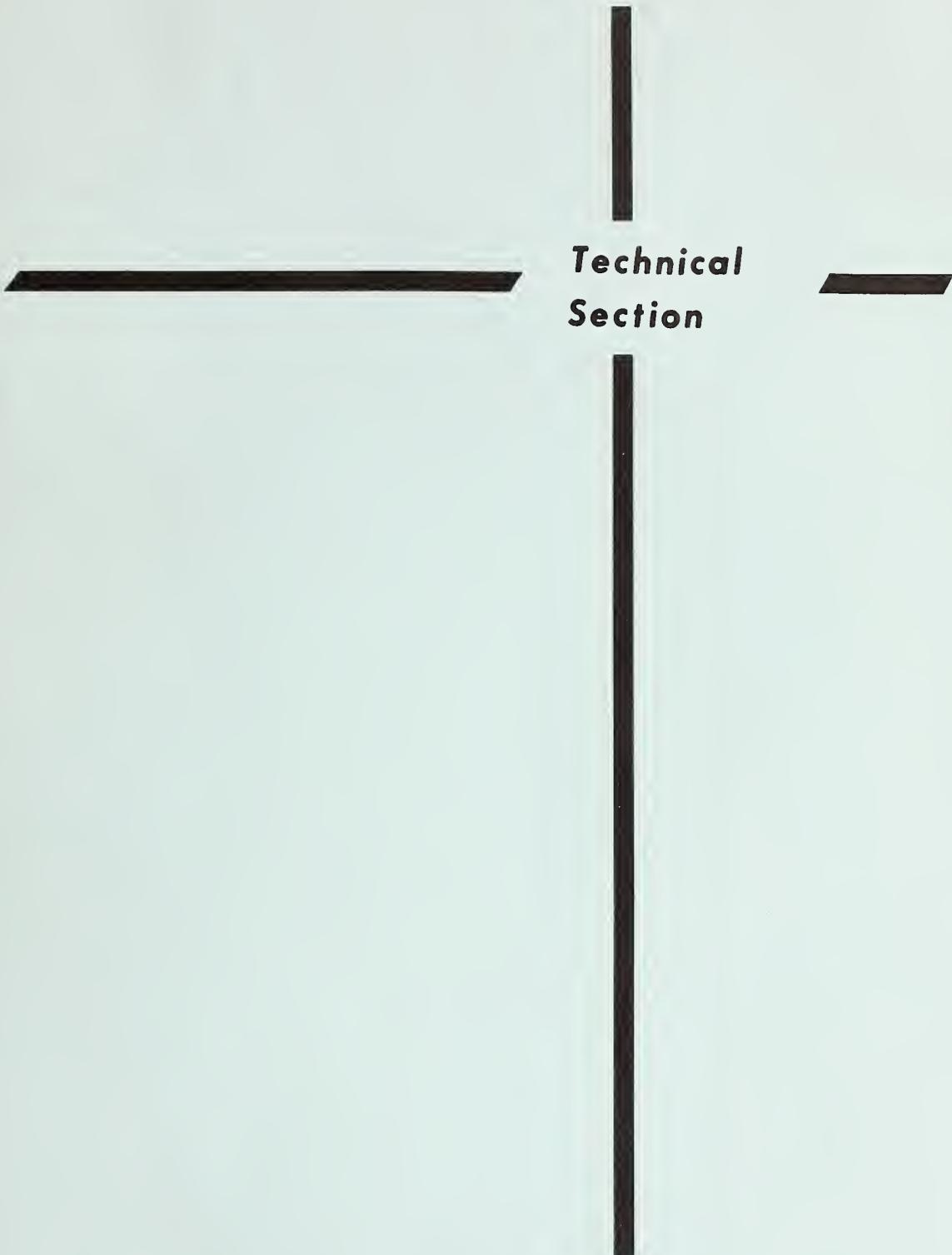
**BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS



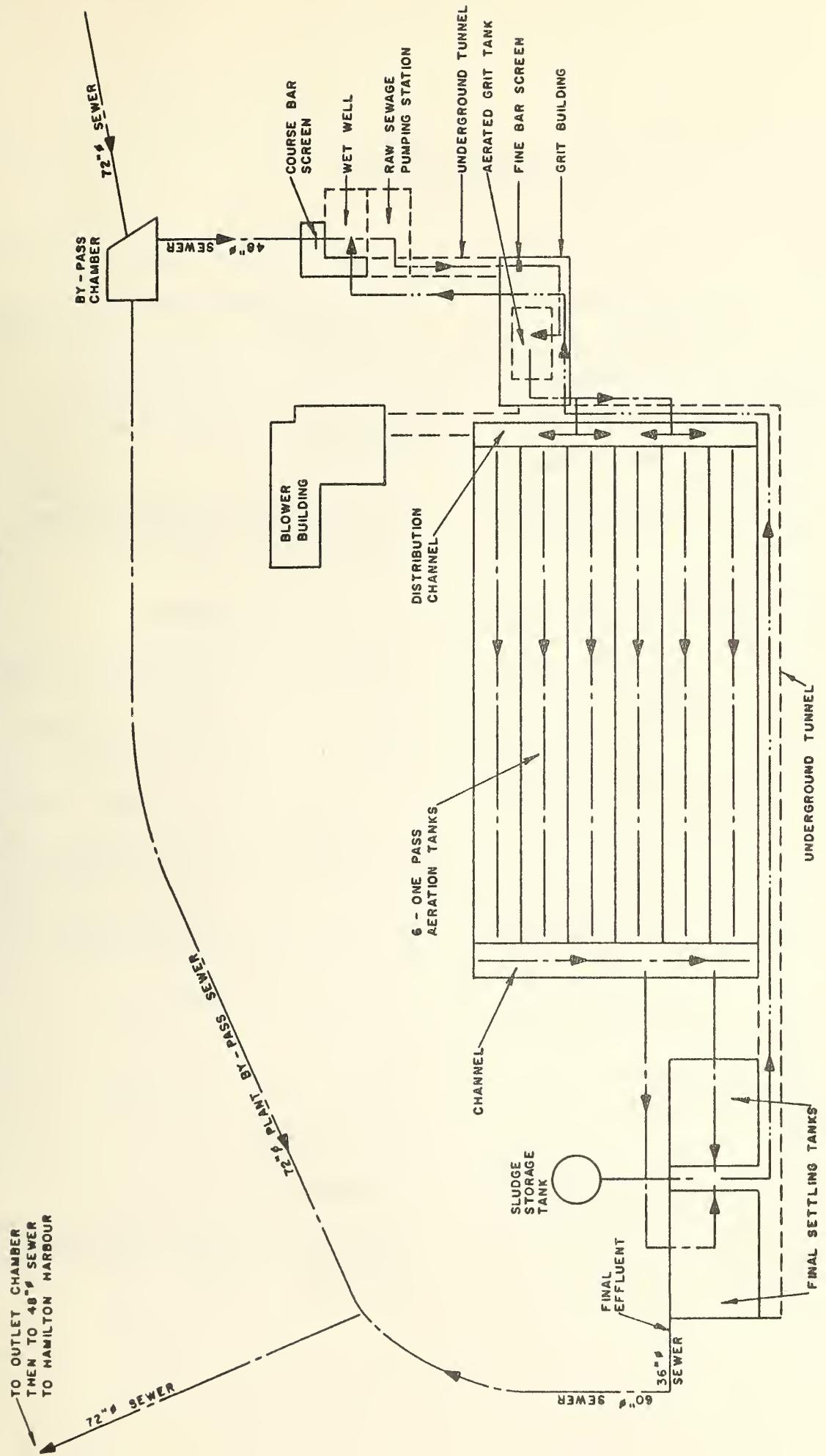
TOTAL ANNUAL COST





***Technical
Section***

SCHEMATIC FLOW DIAGRAM



LEGEND

- SLUDGE FLOW
- RETURN SLUDGE FLOW
- UNDERGROUND STRUCTURES

Design- Data

GENERAL

Type of Plant - Extended Aeration Activated sludge.

Design Population - 35,000 persons.

Design Plant Flow - 3.125 mgd.

Daily Per Capita Flow - 89.3 gallons.

Design Raw Sewage 5 Day BOD - 200 ppm

PRIMARY TREATMENT

Coarse Bar Screen

Mechanical - Link Belt, 2 1/2 clear openings.

Fine Bar Screen

Mechanical - Link Belt, 1 inch clear openings.

Grit Removal

One air degritter, 20.3 feet long, 25.0 feet wide and 14.2 feet average liquid depth.

Detention Time 20.8 minutes at design flow of 3.125 mgd.

SECONDARY TREATMENT

Aeration Tanks

Six tanks each 270.0 feet long 27.0 feet wide and 15.2 feet deep, top liquid depth.

Volume of each path - 110,050 cu. ft.
Volume of six paths - 660,300 cu. ft.

Detention Period at 3.125 mgd. - 31.7 hours.

Applied Design BOD loading at 3.125 mgd 9.5 lbs. BOD per 1000 cu. ft. of tank volume

Air Supply

Three multistage centrifugal blowers, each maximum capacity of 4000 cfm. Diffuser system - 250 ceramic diffusers per tank.

FINAL SEDIMENTATION

Two units each 60.0 feet long, 60.0 feet wide and 12.0 feet side wall depth.

Volume of each settling tank - 43,200 cu. ft.

Detention period at 3.125 mgd - 4.1 hours

Surface Settling rate at 3.125 mgd - 434 gallons per sq. ft. of tank per day.

Overflow rate at 3.125 mgd. 7100 gallons per lin. ft. of weir per day.

SLUDGE THICKENING

One Tank

Diameter 20 feet, 9 feet deep.

Volume 2830 cu. ft.

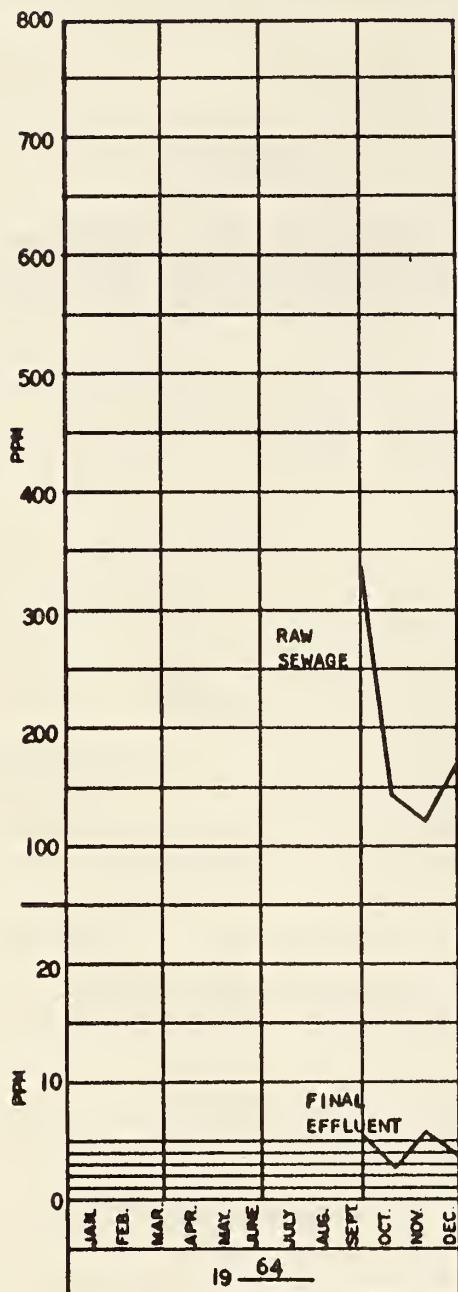
CHLORINATION

Two Fischer and Porter Model 70C3400 chlorinators maximum capacity 2000 lbs. chlorine per 24 hours.

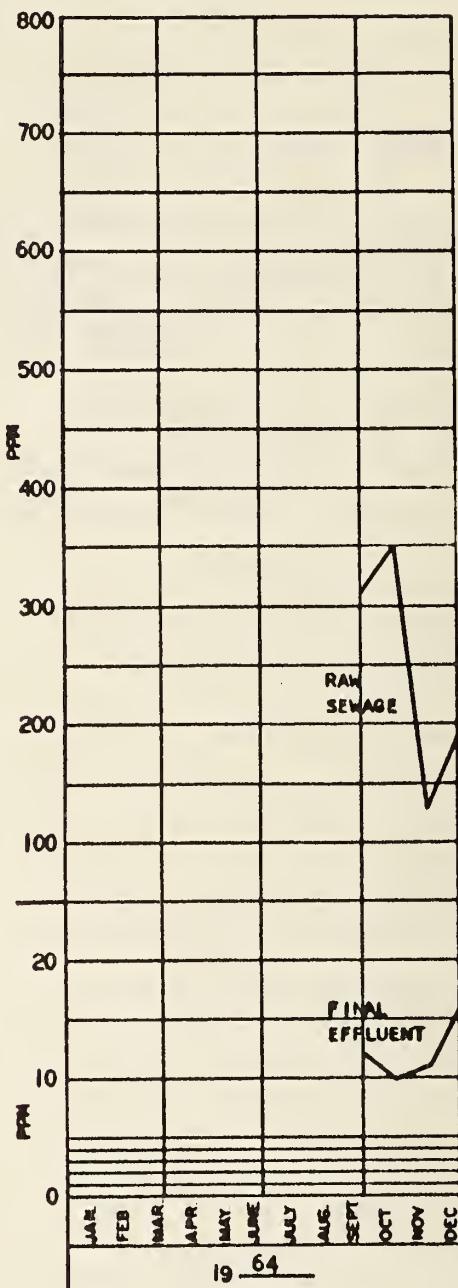
Process Data

On September 2, 1964, the east end trunk sanitary sewer, phase II was completed and placed in operation. As a result the daily flow increased from approximately 100,000 gallons to an average throughout the remainder of the year of 2.24 million gallons.

MONTHLY VARIATIONS



Biochemical
Oxygen Demand



Suspended
Solids

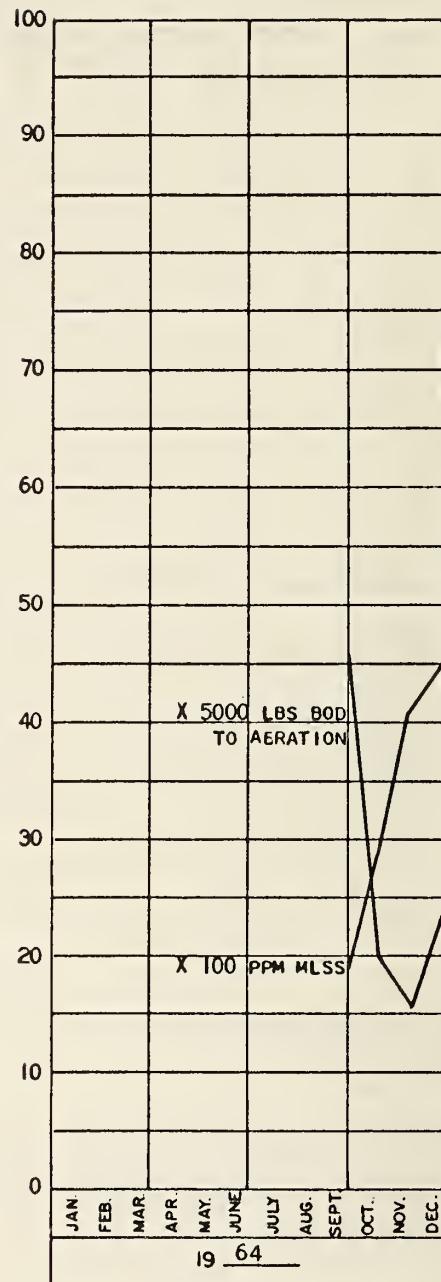
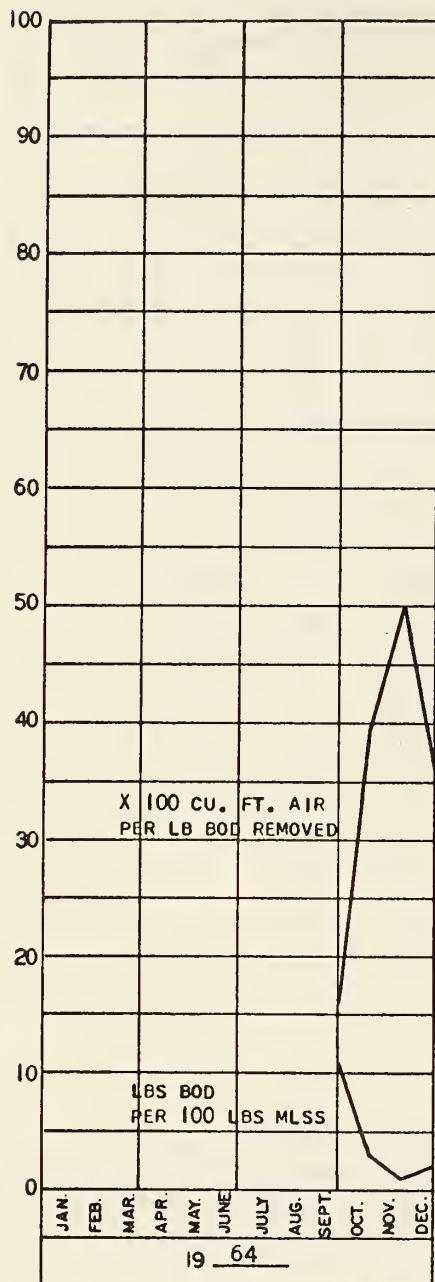
GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	
JAN.	-	-	-	-	-	-	-	-	-
FEB.	-	-	-	-	-	-	-	-	-
MAR.	-	-	-	-	-	-	-	-	-
APR.	-	-	-	-	-	-	-	-	-
MAY	-	-	-	-	-	-	-	-	-
JUNE	-	-	-	-	-	-	-	-	-
JULY	-	-	-	-	-	-	-	-	-
AUG.	-	-	-	-	-	-	-	-	-
SEPT.	340	5.4	98.5	114.4	309	12	96.0	101.6	276
OCT.	145	2.8	98.0	49.8	350	10	97.0	119.0	-
NOV.	123	5.7	95.5	37.8	132	11	91.5	39.0	-
DEC.	172	3.9	97.5	57.2	194	16	91.5	60.6	62.5
TOTAL	-	-	-	258.3	-	-	-	317.1	338.5
AVG.	195	4.4	97.5	64.6	246	12	95.0	79.3	84.6

* began reporting September 6, 1964.

COMMENTS

The average BOD and suspended solids concentrations in the effluent were 4.4 ppm and 12 ppm respectively. The average percent reductions in BOD and suspended solids were 97.5 and 95.0 respectively. These high percent reduction figures indicate that the plant performance was excellent.



AERATION TANK PERFORMANCE

AERATION SECTION

MONTH	* RAW SEWAGE B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	-	-	-	-
FEBRUARY	-	-	-	-
MARCH	-	-	-	-
APRIL	-	-	-	-
MAY	-	-	-	-
JUNE	-	-	-	-
JULY	-	-	-	-
AUGUST	-	-	-	-
SEPTEMBER	340	1886	11	1618
OCTOBER	145	2874	3	3956
NOVEMBER	123	4106	1	4973
DECEMBER	172	4510	2	3588
TOTAL	-	-	-	-
AVERAGE	195	3344	4	3534

*There are no primary tanks in this plant

COMMENTS

In September, the average MLSS was 1886 ppm. The MLSS concentration increased gradually to an average of 4510 ppm in December.

The average BOD loading from September to December was 6.6 pounds per 100 cubic feet of aeration volume. It is normally accepted that extended aeration plants function best at BOD loadings less than 15 pounds per 1000 cubic feet of aeration volume.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	-	-	-
FEBRUARY	-	-	-
= MARCH	-	-	-
APRIL	-	-	-
MAY	-	-	-
JUNE	-	-	-
JULY	-	-	-
AUGUST	-	-	-
SEPTEMBER	*68,397	3408	4.98
OCTOBER	70,009	2544	3.63
NOVEMBER	64,530	-	-
DECEMBER	68,070	-	-
TOTAL	271,006	5952	-
AVERAGE	67.752	2976	4.30

* Began reporting in September 1964

COMMENTS

Final effluent was chlorinated for disinfection purposes until October 15. In the future final effluent will be chlorinated for the period May 15 to October 15. A 15 minute chlorine residual of not less than 0.5 ppm was the objective.

The average recorded dosage of 4.3 ppm is within the accepted range for effluent chlorine dosage.

CONCLUSIONS

The plant operated
standards was pro

ONTARIO WATER RESOURCES COMMISSION
DIVISION OF PLANT OPERATIONS

t meeting OWRC

BURLINGTON (SKYWAY) WATER POLLUTION
CONTROL PLANT.

ANNUAL REPORT 1964

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Ontario Water Resources Co
Burlington Skyway
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